

SOME ASPECTS OF THE BIONOMICS OF THE LAC INSECT.

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PROPORTION OF MALE TO FEMALE LARVÆ FOR EACH DAY OF  
EMERGENCE.

According to Sreenivasaya,<sup>1</sup> Mahdihassan says that the first batch of larvæ to swarm are mainly females, whilst those appearing later are chiefly males. This statement though vague, if correct would prove of great value in lac cultivation. Therefore, to test its accuracy, experiments with a number of individual cells were started in the Katki (July-November) crop in 1928 and repeated during the Baisakhi (November-July) 1928-29 and 1929-30 and the Katki 1929 crops. Each female cell was confined in a small wire gauze case and inoculated on a small plant of Ber (*Zizyphus jujuba*) or Arhar (*Cajanus indicus*). After each 24 hours of emergence the female cell was removed to the next plant, till the emergence of larvæ from the cell stopped.

The identification of sex in the first instar larva of the lac insect is a debatable matter, therefore to avoid controversial points, the inoculated plants were examined for the sex-ratio, only when the male insects had reached the prepupal and pupal stages. The results of these examinations are given in the following tables :—

KATKI 1928.

TABLE I.

COL. I.							
No. of cells out of the total 15, from which emergence took place on days stated in Col. II.	15	11	4	5	4	1	1
COL. II.							
Serial No. of days for which emergence continued in the number of cells stated in Col. I.	1	2	3	4	5	6	7
COL. III.							
Average percentage of females in the progeny of the cells stated in Col. I.	90.2	87.05	88.8	84.09	90.9	50	100

<sup>1</sup> *Ind. Inst. Sc. J.*, Vol. vii, pt. vii, p. 110.

BAISAKHI 1928-29.

TABLE II.

COL. I.													
No. of cells out of the total 21 from which emergence took place on days stated in Col. II.	21	21	19	17	18	16	16	14	11	6	4	2	1
COL. II.													
Serial No. of days for which emergence continued in the number of cells stated in Col. I.	1	2	3	4	5	6	7	8	9	10	11	12	13
COL. III.													
Average percentage of females in the progeny of the cells stated in Col. I.	44.24	41.4	49.6	56.9	72.2	75.8	87.07	85.7	91.4	82.7	75.0	100	0

KATKI 1929.  
TABLE III.

COL. I.										
No. of cells out of the total 15, from which emergence took place on days stated in Col. II.	15	14	14	13	9	9	10	6	3	1
COL. II.										
Serial No. of days for which emergence continued in the number of cells stated in Col. I.	1	2	3	4	5	6	7	8	9	10
COL. III.										
Average percentage of females in the progeny of the cells stated in Col. I.	94.9	84.09	81.4	79.5	91.4	78.9	93.2	79.3	100	100

BAISAKHI 1929-30.  
TABLE IV.

COL. I.															
No. of cells out of the total 25, from which emergence took place on days stated in Col. II.															
18	22	25	22	23	22	21	21	15	17	11	11	1			
COL. II.															
Serial No. of days for which emergence continued in the number of cells stated in Col. I.															
1	2	3	4	5	6	7	8	9	10	11	12	16			
COL. III.															
Average percentage of females in the progeny of the cells stated in Col. I.															
63.49	38.03	40.76	45.19	50.18	71.18	74.61	72.22	63.95	85.39	82.02	92.00	88.88	69.23	82.14	50.00

The study of the above tables clearly shows that the statement made by Mahdihassan, that the first batch of larvæ which swarm are mostly females and those which appear later are chiefly males, is incorrect ; these results also show that the emergence of larvæ from the incubating chamber of the mother is of mixed character and that there is no inter-relation between sequence of emergence and sex ratio.

MOTHER CELLS AND SEX OF THE PROGENY.

In the course of the above study it has been found that :—

I. In the Katki crop (July–October) the progeny of most of the cells of the Baisakhi crop (October–July) develop as is already known into females predominantly ; but further it has been noted that the progeny of some of the cells develop into cent per cent females, and in a few cells, the progeny is intermediate between the two.

II. In the Baisakhi crop, the progeny of most of the cells of the Katki crop grow into predominantly female, of a few cells into predominantly male and of some, the progeny is intermediate between the two. Cells producing males and females from 40–60 per cent have been taken as producers of intermediate progeny regarding sex ratio. The results are tabulated below :—

KATKI CROPS 1928 AND 1929.

TABLE V.

	No. of mother cells under observation	Mother cells whose progeny developed mostly into females.		Mother cells whose progeny developed into cent per cent females.		Mother cells whose progeny was intermediate.	
		No.	Percentage.	No.	Percentage.	No.	Percentage.
	23	17	73·91	5	21·73	1	4·34
Percentage of females in the progeny of these mothers.	81·2	80·08		100		53·9	

BAISAKHI CROP 1928–29 AND 1929–30.

TABLE VI.

	No. of mother cells under observation.	Mother cells whose progeny developed mostly into females.		Mother cells whose progeny developed mostly into males.		Mother cells whose progeny was intermediate.	
		No.	Percentage.	No.	Percentage.	No.	Percentage.
	41	24	58·53	5	12·18	12	39·26
Percentage of females in the progeny of these mothers.	63·5	74·6		33·2		51·1	

## SWARMING PERIOD.

The number of days over which the emergence of larvæ continues from an individual mother, depends, firstly on the temperature, secondly on the egg-laying capacity of the mother, and thirdly on the rate of egg laying. However, from the daily observations on 31 cells during July inoculations in 1928 and 1929 it has been found that:—

11 days is the maximum period for the emergence of larvæ from an individual mother and 6 days is the average period: while in the October-November inoculation observations on 50 cells show that 16 days is the maximum period for emergence to last from an individual mother and 7 days is the average period. The periods of emergence during the month of February are almost the same as those in October-November provided that the day temperature does not fall below the temperature at which the emergence started. It is also interesting to note that the largest number of larvæ swarming on a single day generally emerge from an individual cell in each crop season between the first and the fifth day of the swarming period.

## CHOICE OF BROOD LAC.

Out of 51 apparently healthy mother cells during July inoculations in 1928 and 1929, larvæ failed to emerge from 20 cells. During October-November inoculations the emergence failed from 18 apparently healthy cells out of 68. On examination, dead larvæ in large numbers were found in the incubating chamber of most of the cells. The death of the larvæ in most of these cases proved to be due to the blocking of the anal openings of the lac tests through which the larvæ come out. In the remainder, the female was found to be attacked either by young predator larvæ which seem to have entered the tests through the anal opening, or by full grown parasite grubs. Besides this numerous cases have been noticed in which a mother though apparently quite healthy, for some unknown reason, fails to lay eggs, and consequently no emergence of larvæ takes place. In view of these facts, presumably the best brood for infecting, in cases where available, is one in which the healthy cells are situated closely but separately on the sticks or without much overlapping. This being preferable to brood which has a healthy looking thick incrustation due to excessive overlapping and coalescence of lac tests, because in the latter case there are bound to be a large number of dead and parasitized cells, and also a large number of cells which though living, have the anal openings of their tests blocked, by the neighbouring cells which coalesce and overlap them. This has been further confirmed by numerous observations during the examination of sticks for emergence, etc.

## EGG-LAYING PERIOD.

As egg laying is the preliminary stage to the emergence of larvæ, it has been thought advisable to include some results in this connection, obtained from the data collected on fertility in the various broods, and on the effect of temperature and humidity on egg laying. The egg laying period depends like the emergence period, on the temperature during the swarming season, on the vitality of the mother, and on the number of eggs a mother is going to lay. Egg laying will begin in all the three seasons (June-July, October-November, January-February) if the temperature is above 17°C. In winter however it sometimes begins even at 15-16°C. The average egg laying period for an individual mother in all the broods during all the seasons is about 7 days and the maximum about 14 days. The largest number of eggs laid by a mother on a single day is generally laid between the 2nd and 6th day of the egg laying period.

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CONCLUSION.

(1) Sequence of emergence and sex-ratio can hardly be said to be inter-related.

(2) The Baisakhi crop produces females whose progeny in the majority of cases is predominantly female, in some cent per cent female and in a few intermediate between the two.

The Katki crop produces a major number of females whose progeny is predominantly female, a few whose progeny is predominantly male and some whose progeny is intermediate between the two.

(3) Emergence (swarming) period depends on the temperature, egg laying capacity of the mother and rate of egg laying, 11 days seems to be the maximum swarming period for an individual Baisakhi mother cell, and the average period 6 days: for a Katki mother cell 16 days seems to be the maximum swarming period and 7 days the average. The largest number of larvæ swarming on a single day from a mother cell in all the seasons emerge generally between the 1st and 5th day of the swarming period.

(4) The average egg laying period for an individual cell in all the seasons is about 7 days and the maximum is about 14 days. A mother lays the largest number of eggs in a single day between the 2nd and 6th day of her egg laying period.

(5) The best brood lac is that in which healthy cells are situated closely but separately on the stick or are coalesced without much overlapping.